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GEOLOGY.

Meunier on Meteorites.—The collection of meteorites in the Natural History Museum of Paris is unexcelled to-day in respect to variety and quantity of material amassed. To this series of natural meteorites has been added the products of experimental syntheses resulting from attempts to solve the problem of the origin of meteorites. Further facility in the study of this extramundane material is afforded by bringing together the meteoric minerals and types of analogous earth minerals for the purpose of comparison. It has been thought possible by M. Stanislas Meunier to arrive at some definite conclusion as to the origin and possibly the past history of meteorites by a close study of their composition and a comparison of their mineral constituents with similar minerals occurring in our own earth formations. Such a study, embracing as it does both geological and astronomical facts, he calls comparative geology.

M. Meunier takes for a starting-point the meteorites of Chili, which, for convenience, are classified under special types. Each type is described in detail, its particular lithological characters discussed, and their significance given. In the course of the examination M. Meunier finds true breccias, metamorphic rocks and volcanic rocks so similar to terrestrial eruptions that the closest attention is necessary to detect the difference. The conclusion from these facts is that the original source of these meteors has been the theatre of geological phenomena comparable with those occurring on the earth.

M. Meunier does not hold with the theory that meteors and shooting-stars have a common origin. The chief objections to the theory are: (1) Shooting-stars are never accompanied by noise; meteors always are. (2) Shooting-stars are periodical in appearance; meteors are irregular. He is of the opinion that meteors are fragments of a single star which was constructed on the same general plan as our planet, and notes that it is possible that the fragmentary stage is the last phase of a true sidereal evolution. (*Actes Soc. Scien. du Chili, Tome III.*)

The Origin of Bitumens.—In a recent number of the *American Journal of Science*, S. F. Peckham gives a short account of how he was led to adopt Newberry's " distillation " theory to account for the origin of bitumens. The heat required for distillation results from metamorphic action. In regard to the oils of eastern Ohio and western Pennsylvania, the agent for their production was found in the gradual dying out of the heated area which involved the Appalachian system. Beginning at the Palisades and following a northwesterly line, Mr. Peckham notes the following facts in proof of his theory: Through eastern Pennsylvania the coal is metaphosed into anthracite. At St. Mary's, on the summit of the Alleghanies, the coal is semi-anthracite. In the most easterly county of Pennsylvania in which petroleum is obtained, McKean, the petroleum occurs at a depth of two thousand feet, under a pressure estimated at four thousand pounds to the square inch, and filled with paraffine, just as it ought to be if produced by metamorphism. Further west the petroleum becomes lighter. The products of distillation are present in proper sequence along the entire line from Point Gaspè to Lookout Mountain, and the porous sand-bars and pebbly ripples formed by the currents of the primeval ocean are not filled with the oil, because they afford a receptacle adequate to receive and store the vast accumulations of distillate. (*Amer. Jour. Sci.*, Dec., 1894.)

Changes in Ore Deposits.—The chemical and physical changes that take place in ore deposits exposed to surface influences has been made the subject of study by Mr. R. A. F. Penrose, Jr., and the results of his investigations embodied in the following summary:

The process of alteration is primarily one of oxidation, and generally of hydration, and both of these actions may go on alone, but generally both have their effect upon the same material. The action of surface influences is in rare cases one of reduction. The process of alteration frequently causes leaching of certain ingredients of the ore deposit. A worthless material may be made valuable by the introduction of a new constituent, as in the replacement of a carbonate of lime by a phosphate of lime. Deposits are sometimes concentrated by capillary action in soils.

The physical effect of superficial alteration is to make the deposit more open and porous, and to cause it to shrink. If, however, hydration is active, expansion may be caused.

The depth of alteration varies from a fraction of a foot to 1500 feet, and possibly more.

The accumulation of soluble saline materials on the surface has an important effect in converting certain materials in underlying ore deposits to chlorides, etc. This explains the abundance of haloid compounds in ore deposits of the arid regions of the western part of North America, and in certain parts of Chili and Peru. (*Jour. Geol.*, Vol. II, 1894.)

Dean on Coprolites.—In the description of a new Cladodont shark, *C. newberryi*, from the Ohio Waverly, Mr. Bashford Dean refers to a coprolite found with the specimen, as follows:

"It (the coprolite) is especially interesting, since it furnishes a cast of the intestinal wall, and gives definite evidence as to the presence of a spiral valve. This structure accordingly maintained in the generalized Cladodont, and that the intestinal septa were here low and numerous is most significant phylogenetically. Its condition in this form, as the nearest known ancestor of Selachians, would, moreover, give an additional reason for emphasizing the most ancient origin of Dipnoan, Teleostome, and even Chimæroid."

This discovery of Dr. Dean throws a light upon certain screw-like fossils described under the names Spiraxis, Spirangium, etc. Newberry's descriptions and figures of *Spiraxis major* and *S. randallii*, from the Chemung sandstone, are identical with the coprolite figured by Dr. Dean from the intestine of the shark. The inference, then, is that many of these screw-like forms from geological horizons, in which sharks are numerous, and which have been referred by different investigators to Algæ, are in reality coprolites. (*Trans. N. Y. Acad. Sci.*, Vol. XIII, 1894.)

New Molluscan Forms from the Dakota Formation.—So little is known of the fauna of the Dakota formation that great interest is attached to the discovery by Dr. Hicks of some invertebrate remains in Jefferson County, Nebraska. The Dakota strata in this locality consist of ferruginous limestone, the fossiliferous layers being impure limonite. The fossils are all either vegetal or molluscan, and are in the condition of natural casts, molds or imprints. The mollusca were referred for identification to Dr. Charles A. White, who describes and figures them in the Proceedings of the National Museum. The collection comprises five new species and two doubtful ones, all indicating unmistakably, in the author's opinion, a purely fresh-water fauna.

In his concluding remarks, Dr. White refers to the unusual interest attached to these new forms by reason of the following facts:

"It is one of only three collections of invertebrate remains from the Dakota formation. It indicates, more distinctly than any previously discovered facts have done, the nonmarine character of that formation. It embraces four genera which have never before been recognized in collections from its strata. Lastly, although this formation lies at the base of the Upper Cretaceous series, a majority of the species which this collection contains belong to genera representatives of which are among the characteristic members of the molluscan fauna now living in the waters of the Mississippi drainage system. (*Proceeds. U. S. Natl. Mus.*, Vol. XVII, 1894.)

Glacial Lakes in Western New York.—This subject is treated in two papers which describe briefly the glacial lacustrine history of Western New York, introductory to fuller treatment hereafter. The author shows, with the aid of specially prepared maps, how the remarkable valleys of the "finger lakes" terminate abruptly at their southern ends in the high land which forms the divide between the St. Lawrence and the Susquehanna—Ohio waters. The deep preglacial valleys, cut to some unknown depth through the divide, have been partly filled with frontal moraine drift-making cols, which were the waste-weirs for the glacial waters.

As the ice-sheet slowly retreated northward, it was a barrier to the waters which were poured in the south ends of these deep valleys and forced to overflow into the Susquehanna. In all the valleys a well-marked abandoned stream channel is found south of the col, while north of the col are found the delta deposits of the streams which emptied into the glacial lakes at their maximum and later levels.

The author described with some detail several of those local glacial lakes, among which were the Watkins (glacial Seneca) Lake, which at its maximum was about thirty miles long, some four to eight miles wide and one thousand feet deep. The Ithaca (glacial Cayuga) was even larger and deeper than the Watkins Lake. The deltas and shore inscriptions of all the glacial lakes are well marked, and in this lies proof of the power of ice to act as barrier to deep water.

Glacial lakes also occupied valleys in which to-day there are no lakes, but free northward-flowing streams, as the Tonawanda, Canaseraga, Genesee, Onondaga and others. Professor Fairchild named eighteen of the local glacial lakes from Attica on the west to Tully Valley on the east.

As the ice-lobe damming each of the several glacial lakes melted, the waters were lowered into the level of the great water body which buried all of Western New York north of the divide and most of the area of the Great Lakes. At first this water had its outlet at Chicago, and has been named by Mr. Spencer, Lake Warren. But when the ice by its retreat finally uncovered the Seneca Valley, the outlet of the Watkins Lake at Horseheads became, owing to the depression of the "Finger" lakes region, the outlet of the Continental lake, and this remained the outlet until the ice, by its further retreat, uncovered the

Mohawk Valley and differentiated the waters, the lake then covering the Ontario depression, being known as Lake Iroquois. For the lake having its outlet at Horseheads, and lying both in geographical horizon and in time between lakes Warren and Iroquois, Professor Fairchild proposed the name Lake Newberry. —H. L. FAIRCHILD.

Geological News, General.—An excellent geological map of Alabama has just been issued by the Geological Survey of that State. For the exact determination of the limits of the geological formations as shown in the map, its chief responsibility and credit are as follows: Formations of the coastal plain, Smith, Langdon and Johnson; coal measures, McCalley, Squire and Gibson; other Paleozoic formations, McCalley, Gibson and Hayes; crystalline rocks, Smith, Phillips and McCalley. The colors chosen are distinct, so that the different horizons are well defined. An explanatory chart accompanies the text.

According to F. Leslie Ransome, Angel Island, in San Francisco Bay, affords an example of a pronounced contact metamorphism effected by the rock of which serpentine is a derivative, and by the fourchite, upon cherts and sandstones through which they have forced their way. The resulting rocks consist almost wholly of holocrystalline schists, which present no essential differences when derived from sandstone from those formed by the metamorphism of the chert; also, the schist produced by contact metamorphism alongside the serpentine has no distinct feature differentiating it from that adjacent to the fourchite. This leads to the generalization that the attempt to assign all of the glaucophene schists of the coast ranges to a general regional metamorphism must be abandoned. (*Bull. Dept. Geol. Cal. University.*, Vol. I, 1894.)

Archean.—The so-called Lower Laurentian rocks, near St. John, N. B., are found by W. D. Matthew to consist in large part of intrusives of two types, Granite-diorite and Olivine-gabbaro. The age of the first of these is later than the Upper Laurentian limestone, and may be Devonian, but is probably pre-Cambrian. The age of the gabbro is not given. (*Trans. N. Y. Acad. Sci.*, Vol. XIII, 1894.)

Paleozoic.—The fossils from the Trenton limestones of New York, referred by Prof. Hall to the Graptolitidæ under the names of *Buthograptus laxus* and *Oldhamia fruticosa*, are shown by Prof. Whitfield to be true marine Algæ of the articulate type. The form of the Buthograptus when living was probably plumose, with a cylindrical axis, from which a series of pinnules arose on two opposite sides, not quite opposite to each other at their origin, but slightly alternating. These pinnules were probably cylindrical, somewhat club-shaped, and attached to the axis by the knob-like inner end. Since the name *Buthograptus* is misleading, the author suggests *Bythocladus* as more appropriate. Of the so-called Oldhamia, Prof. Whitfield has found three forms which he describes and figures in the *Bull. Amer. Mus. Nat. Hist.*, Vol. VI, 1894.

A new fossil fish, *Psammosteus taylorii,* from the Upper Old Red Sandstone of Morayshire, Scotland, is reported by Dr. Traquair. The new species is based on detached plates thick and smooth internally, and as to contour are gently hollowed in boat-like fashion. The microscopic structure of the remains suggests that they were Selachian in their nature. (*Ann. Scottish Nat. Hist.*, 1894.)

Bulletin No. 4 of the Illinois State Museum of Natural History contains descriptions by Miller and Gurley of thirteen new Crinoids from the Upper Devonian and Niagara of Indiana, Kentucky and Illinois. Three plates accompany the descriptions.

Mr. E. O. Hovey regards the Lower Magnesian and Lower Carboniferous cherts of southern Missouri due to chemical precipitation at the time of the deposition of the strata in which they occur or before their consolidation. (*Amer. Jour. Sci.*, 1894.)

Mesozoic.—The study of new material by Prof. Seeley confirms Huxley's conclusions concerning *Euskelesaurus brownii,* a fossil Dinosaurian from South Africa. The jaw is formed on the type of Megalosaurus, but the pubis resembles that of Massospondylus. Prof. Seeley places it in the Saurischia in near association with the latter genus and Zanclodon, though with a near approximation to Megalosaurus. The evidences for these conclusions are given in the account to the several bones. (*Amer. Mag. Nat. Hist.*, Nov., 1894.)

M. H. E. Sauvage calls attention to some reptiles found in the upper part of the Jurassic beds of Boulonnais. A list of the species determined by the author comprises four Ichthyopteryians, eleven Sauropterygians, one Pterodactyle, four Dinosaurians, eight Crocodiles and seven Chelonians. (*Revue Scientifique,* Dec., 1894.)

According to Capt. H. G. Lyons, the Nubian sandstone of Egypt and Nubia is of Cretaceous age, and is probably an estuarine deposit. In the Lybian Desert this sandstone forms an immense table-land, weathered into flat-topped masses and truncated pyramids, witnesses of the amount of erosion that has taken place. Upper Cretaceous rocks overlie the sandstone near Esna, and are exposed over a large area forming the floors of the oases of Kharga, Dakhla and Tarafra. (*Quar. Jour. Geol. Soc.*, Nov., 1894.)

Cenozoic.—Mr. Barbour presents some additional notes on the new fossil, Dæmonelix, from the Pine Ridge table-lands in Nebraska. Further examination of the locality in which the fossil occurs shows that the whole deposit is undoubtedly aqueous in origin, and the author gives his reasons for believing the fossils to be contemporaneous with the sediment. A singular fact revealed by the microscope is that every section, no matter from what specimen or from what portion of each individual specimen the section is made, shows perfectly definite and unmistakable plant-structure. (*Univ. Studies,* Vol. II, 1894.)

A fine specimen of *Cervus* (*Eurycerus*) *hibernincæ* Owen belonging to Dr. Krantz Museum affords Dr. Pohlig an opportunity for studying the relation of this species to others of the same group. He shows that the deer (*Cervus dama*), and not the elk (*C. alces*), is the nearest ally of Eurycerus, and that these two species are closely united by transitional forms in both types. Dr. Pohlig bases these relations between the different species of the Cervidæ upon the development of the antlers. (*Bull. Soc. Belge de Geol., Tome VIII,* 1894.)

Numerous small displacements produced since the glacial period in the rocks about St. John, N. B., are noticed by G. F. Matthew. The faults vary from one-quarter ot an inch to five inches, and in almost every case the downthrow was on the north side, and the leade of the fault was to the southwest. (*Amer. Jour. Sci.*, Dec., 1894.)